

***Status Update for  
Implementing Best Available  
Technology per DOE Order  
5400.5***

**Idaho  
Completion  
Project**

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Bechtel BWXT Idaho, LLC

***September 2004***

# **Status Update for Implementing Best Available Technology per DOE Order 5400.5**

**September 2004**

**Idaho Completion Project  
Idaho Falls, Idaho 83415**

**Prepared for the  
U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Under DOE Idaho Operations Office  
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## **ABSTRACT**

This report identifies discharges of liquid waste streams that require documentation of the best available technology selection process at Bechtel BWXT Idaho, LLC, operated facilities at the Idaho National Engineering and Environmental Laboratory. The best available technology selection process is conducted according to Department of Energy Order 5400.5, Chapter II (3), “Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns” and Department of Energy guidance. This report evaluates only those liquid waste streams and facilities where the best available technology selection process was determined to apply. Two facilities (Idaho Nuclear Technology and Engineering Center New Percolation Ponds and Test Area North/Technical Support Facility Sewage Treatment Plant Disposal Pond) at the Idaho National Engineering and Environmental Laboratory required documentation of the best available technology selection process. These two facilities required documentation of the best available technology selection process because they discharge wastewater that may contain process-derived radionuclides to a soil column even though the average radioactivity levels are typically below drinking water maximum contaminant levels. At the request of the Department of Energy Idaho Operations Office, the 73.5-acre Central Facilities Area Sewage Treatment Plant land application site is included in this report to ensure the requirements of DOE Order 5400.5, Chapter II, Section 3 are met. The Central Facilities Area Sewage Treatment Plant effluent contains process-derived radionuclides from radioactive tracers used in certain analytical procedures. The radioactivity levels of these radionuclides are below maximum contaminant levels. The Department of Energy Idaho Operations Office will submit this report to their field office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).



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## ACRONYMS

BAT	best available technology
BBWI	Bechtel BWXT Idaho, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
DCG	Derived Concentration Guide
DEQ	Idaho Department of Environmental Quality
DOE	Department of Energy
DOE Idaho	Department of Energy Idaho Operations Office
ECF	Engineering Change Form
EDF	Engineering Design File
ICARE	Issue Communication and Resolution Environment
ICP	Idaho Completion Project
ICS	interim control strategy
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LET&D	Liquid Effluent Treatment and Disposal
MCL	maximum contaminant level
pCi/L	picocuries per liter
PEP	project execution plan
PEW	Process Equipment Waste
PLN	plan
STP	sewage treatment plant
TAN	Test Area North
TSF	Technical Support Facility
WGS	Waste Generator Services
WLAP	Wastewater Land Application Permit





# Status Update for Implementing Best Available Technology per DOE Order 5400.5

## 1. INTRODUCTION

This report identifies the discharges of liquid waste streams that require documentation of the best available technology (BAT) selection process at Bechtel BWXT Idaho, LLC (BBWI)-operated facilities at the Idaho National Engineering and Environmental Laboratory (INEEL). The best available technology selection process is conducted according to Department of Energy (DOE) Order 5400.5, Chapter II (3), “Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns”<sup>1</sup> and DOE guidance.<sup>a</sup> The DOE Idaho Operations Office (DOE Idaho) will submit this report to their field office manager for approval according to DOE Order 5400.5, Chapter II, Section 3.b.(1).

Last year’s *Status Update for Implementing Best Available Technology per DOE Order 5400.5*<sup>2</sup> was reviewed. BBWI-operated facilities were also reviewed to determine if any previously unidentified liquid waste streams require the BAT selection process. The purpose of the review was to identify those liquid waste streams and/or facilities that require documentation of the BAT selection process or further evaluation.

It was determined from the review, that only liquid waste streams that will continue to be discharged to soil columns for indefinite periods and that contain or may contain process-derived radionuclides require documentation of the BAT selection process. Currently, no liquid waste streams containing process-derived radionuclides discharge to surface waters, and no liquid waste streams discharge to a sanitary sewerage at greater than five times derived concentration guide<sup>3</sup> (DCG) values for radionuclides.

For this report, liquid waste (wastewater) from the following INEEL sources were reviewed:

- Wastewater Land Application Permit (WLAP) facilities
- Routine operations that dispose of process wastewater
- Nonroutine projects, such as decontamination and decommissioning, surveillance, and maintenance.

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a. James R. Cooper, DOE-ID, e-mail to Brett R. Bowhan, R. M. Kauffman, etc., “Perc Pond Update,” February 5, 2001, 10:38 a.m., CCN 35553.

## 2. OVERVIEW OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS

### 2.1 Applicability of the Best Available Technology Selection Process

The BAT selection process applies to those liquid waste streams identified in Table 1.

Table 1. Liquid waste streams applicable to best available technology selection process.

Liquid Waste Stream	Requirement
Liquid wastes containing radionuclides from DOE activities that are discharged to surface water. The BAT selection process is used if the surface waters otherwise would contain, at the point of discharge and prior to dilution, radioactive material at an annual average concentration greater than the DCG values in liquids given in Chapter III of DOE Order 5400.5. <b>NOTE:</b> <i>For the purposes of BAT and DOE Order 5400.5, "surface water" is defined as naturally occurring waters such as rivers, streams, lakes and springs when flowing in their natural channels.</i>	DOE Order 5400.5, Chapter II, Section 3.a.
Liquid waste streams that will continue to be discharged to soil columns for indefinite periods and that contain process-derived radionuclides.	DOE Order 5400.5, Chapter II, Section 3.b.(1)
Liquid wastes discharged from DOE activities into sanitary sewerage containing radionuclides at concentrations, averaged monthly, that would otherwise be greater than five times the DCG values for liquids at the point of discharge.	DOE Order 5400.5, Chapter II, Section 3.d

In addition, DOE Headquarters has provided the following guidance<sup>b</sup>:

- If BAT is being implemented and the liquid waste stream is below 1 DCG but is above the drinking water radiological maximum contaminant levels<sup>4</sup> (MCLs), it is acceptable to discharge "clean water" (from a radiological standpoint) to the soil column. This is not considered a discharge to a soil column under DOE Order 5400.5 because the soil column is not being used as a treatment system to remove radionuclides.
- If the liquid waste stream is at or below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the BAT selection process.

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b. James R. Cooper, DOE-ID, e-mail to Brett R. Bowhan, R. M. Kauffman, etc., "Perc Pond Update," February 5, 2001, 10:38 a.m., CCN 35553.

- BAT does not necessarily require a treatment system for the discharge; however, it should be shown that the water being discharged is as clean as practicable and below DCGs.

## 2.2 Liquid Discharges Not Requiring the Best Available Technology Selection Process

The BAT selection process only applies to those liquid waste streams containing process-derived radionuclides at the point of discharge from the conduit to the environment (DOE Order 5400.5, Chapter II, Section 3). The following are examples of liquid discharges that do not meet this requirement:

- Storm water that may be contaminated as a result of radiological contamination from atmospheric deposition or past operating practices (residual radioactive material). **NOTE:** *Residual radioactive material is defined as “any radioactive material which is in or on soil, air, equipment, or structures as a consequence of past operations or activities.”*
- Production water, potable water, firewater, steam condensate, etc., that has not passed through a radiologically contaminated process.
- Street and building wash water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material).
- Liquid discharges to evaporation ponds.
- INEEL well purge water. Radiological contamination would be from atmospheric deposition or past operating practices (residual radioactive material).

## 2.3 Radiological Evaluations

The INEEL had previously used a number of different references or screening values to evaluate wastewater for its associated risk to human health and the environment. The objective of using these references was to meet DOE requirements, protect human health, and minimize potential future environmental characterization and cleanup liability at INEEL wastewater disposal sites.

Currently, for radiological contaminants in wastewater, MCLs and DCGs are the primary standards used at BBWI-controlled facilities at the INEEL to determine acceptable release levels to a soil column.

Effective July 29, 2004, acceptable release levels (including radiological parameters) can now be determined by implementing Plan (PLN)-932 (“Management Plan and Implementation of Best Available Technology per DOE Order 5400.5 for Disposal of Wastewater”<sup>5</sup>). Proper implementation of PLN-932 will ensure discharges to soil columns meet DOE Order 5400.5 requirements.

## 2.4 Documentation of the Best Available Technology Selection Process

Table 2 shows the three facilities identified for additional documentation of the BAT selection process, the justification, and applicability. The average radioactivity levels in the effluent discharged to these three facilities are typically below MCLs. As indicated in the guidance in Section 2.1, when the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the waste stream is considered clean water from a radiological standpoint; however, this must be documented.

Table 2. INEEL facilities identified for documentation of best available technology selection process.

Facility	Justification for BAT Selection Process	Applicability
Idaho Nuclear Technology and Engineering Center (INTEC) New Percolation Ponds	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing low activity levels of process-derived radionuclides.
Test Area North/Technical Support Facility (TAN/TSF) Sewage Treatment Plant (STP) Disposal Pond	Liquid waste streams potentially containing process-derived radionuclides will continue to be discharged to a soil column for an indefinite period	Low potential for inadvertent releases (for example, equipment failures) of process-derived radionuclides. Facility may be used for disposal of individual waste streams containing low activity levels of process-derived radionuclides.
Central Facilities Area (CFA) Sewage Treatment Plant (STP)	DOE Idaho request	Discharge of wastewater containing radioactive tracers used in certain analytical procedures. Facility may be used for disposal of additional waste streams containing low activity levels of process-derived radionuclides. CFA STP wastewater is then discharged to a 73.5-acre land application site.

## **2.5 Best Available Technology Selection Process**

Typically, selection of BAT for a specific application is made from among candidate alternative treatment technologies. Those alternative treatment technologies are identified by an evaluation process according to DOE Order 5400.5, Chapter II, Section 3.a.(1)(a). The evaluation process includes factors related to technology, economics, and public policy considerations.

As discussed in Section 2.1, if the liquid waste stream is at or below MCLs, the goals of the BAT selection process are being met and the liquid waste stream is considered “clean water.” The DOE Headquarters guidance further states that this must be documented through the BAT selection process. However, because of the already low radioactivity levels in the wastewater discharged from the three facilities identified in Section 2.4, the detailed BAT selection process will not be performed. This is based on the cost consideration component of the BAT selection process, which would preclude the need for additional treatment. In other words, any additional treatment would be unjustifiable on a cost-benefit basis.

Therefore, the information provided in Section 3 of this report shall be considered adequate documentation of the BAT selection process. Depending on the facility, this information may include the following:

- Facility description
- Interim control strategy
- Sources and control of radiological contamination
- Radiological monitoring.

### 3. DOCUMENTATION OF THE BEST AVAILABLE TECHNOLOGY SELECTION PROCESS FOR BBWI-OPERATED FACILITIES

The following sections describe the BBWI-operated facilities (Central Facilities Area [CFA], Idaho Nuclear Technology and Engineering Center [INTEC], Test Area North/Technical Support Facility [TAN/TSF]; Figure 1), their respective wastewater disposal sites, sources and control of radiological contamination, interim control strategy (as applicable), radiological monitoring results for January 2003 through March 2004, and the methodology to ensure compliance with DOE Order 5400.5.

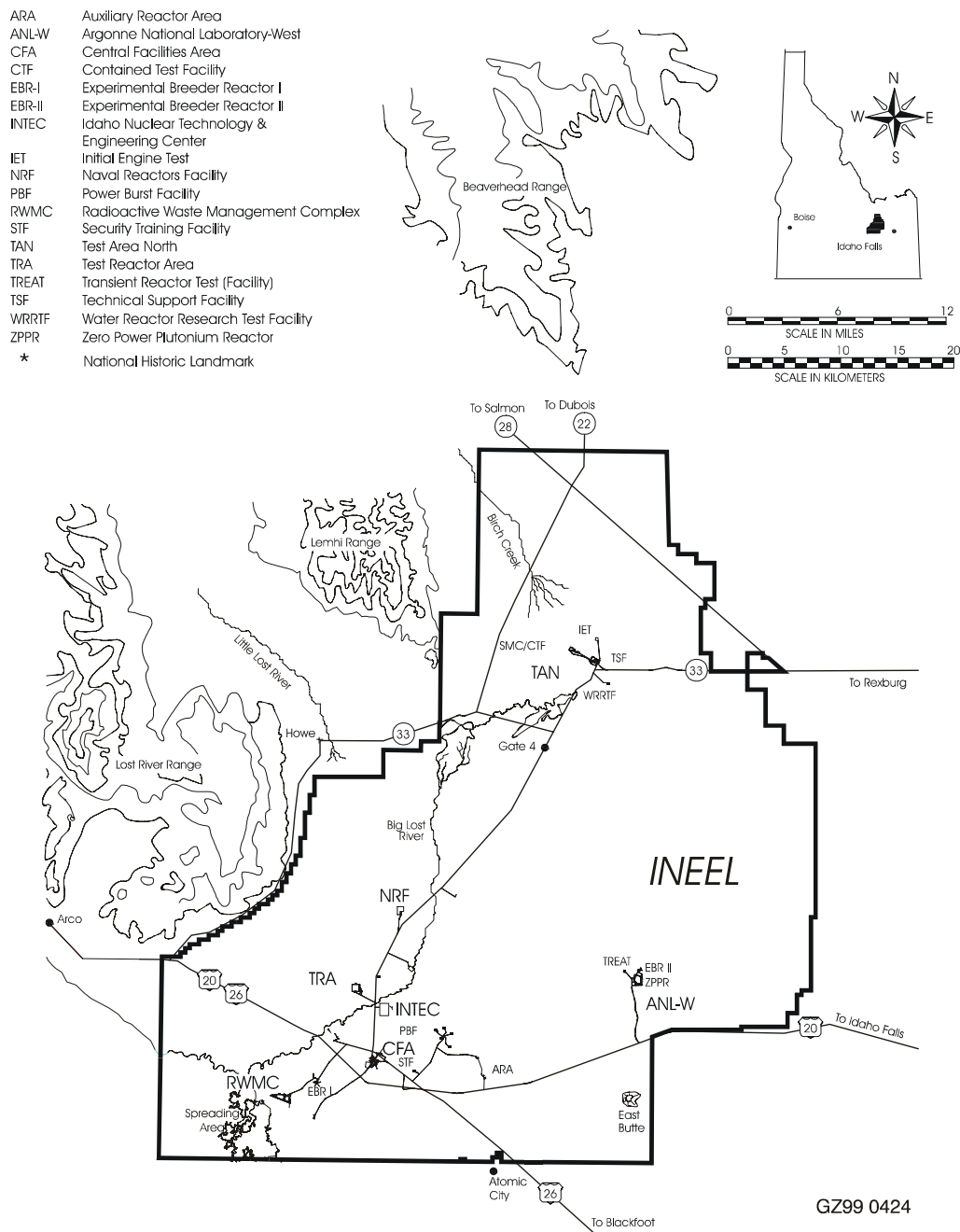
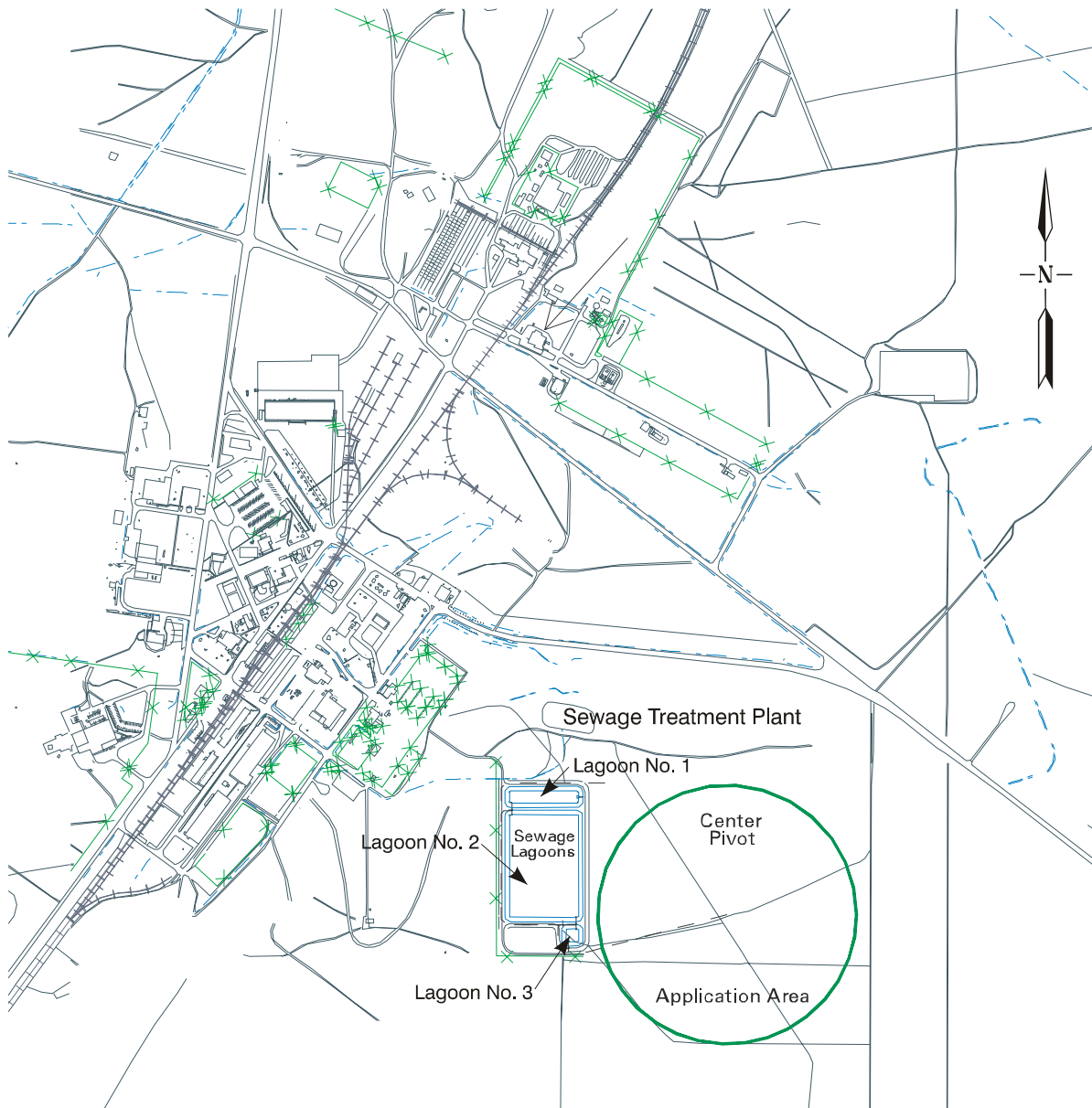


Figure 1. Idaho National Engineering and Environmental Laboratory facilities.

### 3.1 Documentation of the Best Available Technology Selection Process for the Central Facilities Area Sewage Treatment Plant

The CFA Sewage Treatment Plant (STP) serves all major facilities at CFA (Figure 2). The STP is southeast of CFA, approximately 2,200 ft downgradient of the nearest drinking water well. Wastewater from the CFA STP is applied to approximately 73.5 acres (approximately 65 acres when end gun is not in use) by a pivot sprinkler system. The CF-625 laboratory uses radionuclide tracers while performing bioassay analyses. These radionuclides (considered process-derived) are discharged to the CFA STP.



02-GA50935-01

Figure 2. Map of Central Facilities Area.

### **3.1.1 Central Facilities Area Sewage Treatment Plant General Information**

The CFA STP was built in 1994 and put into service on February 6, 1995. It processes approximately 110,000 gallons per day (gpd) of water from sanitary sewage drains throughout the CFA. Wastewater is derived from rest rooms, showers, and the cafeteria, a significant portion of which is comprised of noncontact cooling water from air conditioners and heating systems. This large volume of cooling water dilutes and weakens the wastewater effluent. Other contributing discharge sources include those from bus and vehicle maintenance areas, analytical laboratories, medical dispensary, and other approved waste streams.

The STP consists of:

- 1.7-acre partial-mix, aerated lagoon (Lagoon No. 1)
- 10.3-acre facultative lagoon (Lagoon No. 2)
- 0.5-acre polishing pond (Lagoon No. 3)
- Sprinkler pivot irrigation system, which applies wastewater on up to 73.5 acres of desert rangeland vegetation.

Wastewater is collected at the lift station and pumped under pressure to Lagoon No. 1. Floating-type aerators mix, aerate, and agitate the wastewater within the cell of the first lagoon. Under normal operation, the wastewater flows by gravity from Lagoon No. 1 to Lagoon No. 2 and into Lagoon No. 3. The wastewater flows through an outlet structure in Lagoon No. 3 and is pumped out to the center pivot irrigation system.

A 400-gallon-per-minute pump applies wastewater from the lagoons to the land through a computerized center pivot system. The center pivot operates at low pressures (30 lbs/in.<sup>2</sup>) to minimize aerosols and spray drift. The Wastewater Land Application Permit (WLAP) limits wastewater application to 25 acre-in./acre/year from March 15 through November 15 and limits leaching losses to 3 in./year. A total of 2.99 acre-in/acre of wastewater was applied during Permit Year 2003.<sup>6</sup> When coupled with the precipitation for the same time period, this relatively low volume resulted in a leaching loss of only 0.01 inches.

On July 25, 1994, the Idaho Department of Environmental Quality (DEQ) issued a WLAP for the CFA STP. That WLAP expired on August 7, 1999. However, on September 18, 2000, DEQ issued a letter authorizing the continued operation of the CFA STP under the original WLAP.<sup>7</sup> The authorization is effective until DEQ issues a new WLAP.

### **3.1.2 Sources and Controls for Radionuclide Contamination**

Analyses on bioassay samples (urine and fecal matter) are performed at the CF-625 laboratory. Minute quantities of radioactive tracers are added to the samples prior to the analysis. Therefore, the wastewater generated during these analyses contains both process-derived and naturally occurring radionuclides. Approximately 330 gallons of this wastewater was generated in 2003<sup>c</sup> and discharged to

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c. M. R. Greenhalgh, INEEL, e-mail to M. G. Lewis, INEEL, "Radionuclide Discharges to the CFA Sewage Treatment Plant," July 27, 2004, 6:49 am, CCN 51481.



the CFA STP. It has been determined through analysis and process knowledge that the radioactivity levels in the wastewater are below MCLs prior to discharge into the sewage system.<sup>d</sup>

PLN-932 was implemented to dispose of approximately 60,000 gallons of reactor secondary cooling loop and cooling tower basin water stored in an open evaporation tank (PER-706) at the Power Burst Facility to the CFA STP. Engineering Design File (EDF)-5038, “PER-706 Secondary Cooling Water Characterization and Disposition,”<sup>8</sup> provides documentation of the characterization activities for this wastewater. This wastewater was disposed of in August 2004.

### 3.1.3 Radiological Sample Results

Two 24-hour composite samples were collected. One sample was collected on July 29, 2003, and the other sample was collected on July 30, 2003, from the CFA-STF (CFA-STF is the designation for the sampling point located just prior to the wastewater being discharged to the sprinkler pivot). The July 29, 2003, sample was analyzed for tritium, iodine-129, strontium-89, and strontium-90. The July 30, 2003, sample was analyzed for gross alpha, gross beta, and gamma spectroscopy. Radionuclides that were reported as positively detected above their minimum detectable activity levels are shown in Table 3.

Table 3. Central Facilities Area Sewage Treatment Plant (CFA-STF) effluent radiological data for Calendar Year 2003.<sup>a</sup>

Parameter	Sample Date	Activity (pCi/L)	MCL <sup>b</sup> (pCi/L)
Gross beta	7/30/03	7.47	15 <sup>c</sup>
Iodine-129	7/29/03	0.306	1
Tritium	7/29/03	7,670	20,000

a. Only those parameters that were reported above the laboratory minimum detectable activity levels are listed.

b. Maximum Contaminant Level, 40 CFR 141 unless otherwise specified.

c. Screening level of 15 pCi/L gross beta is used for community water systems utilizing waters designated by the state as contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)].

### 3.1.4 Conclusion

The radioactivity levels in the CFA STP effluent show that the wastewater is below MCLs. As discussed in Section 2, wastewater below MCLs indicates that the goals of the BAT selection process are being met and that the wastewater is considered “clean” for radionuclides. However, this must be documented through the BAT selection process.

The radioactivity levels in the wastewater discharged from the CFA STP to the land application area are already below MCLs. After applying the cost consideration component of the BAT selection process, it was apparent that any additional treatment would be unjustifiable and too costly for the minimal benefit.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. Waste Generator Services (WGS), at the request of the responsible manager or designee,

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d. A. R. Bhatt, INEEL, e-mail to M. G. Lewis, INEEL, “Radionuclide Discharges to the CFA Sewage Treatment Plant,” July 14, 2003, 10:47 a.m, CCN 43737.

evaluates discharges to the CFA STP that may contain process-derived radionuclides. The mission of the WGS is “to provide the INEEL on-site and off-site waste generators with professional waste management services and to disposition legacy and newly generated waste in a safe, compliant, timely, and cost effective manner.” The WGS ensures the liquid waste is disposed of according to federal, state, and local regulations, and DOE orders.

To ensure the effluent discharged from the CFA STP complies with DOE Order 5400.5, newly identified liquid waste streams are evaluated by WGS prior to discharge into the CFA STP. Implementation of PLN-932 provides additional guidance to ensure compliance with DOE Order 5400.5.

Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process determines whether the wastewater will require additional treatment prior to discharge.

### **3.2 Documentation of the Best Available Technology Selection Process for the Idaho Nuclear Technology and Engineering Center New Percolation Ponds**

On August 26, 2002, discharge of wastewater ceased to the Existing Percolation Ponds and was transferred to the New Percolation Ponds. This section (Section 3.2) of the report addresses discharge of service waste wastewater to the INTEC New Percolation Ponds (Figure 3).

Documentation of the BAT selection process applies to the INTEC New Percolation Ponds due to the potential for inadvertent releases (for example, due to equipment failures) of radionuclides and the possible disposal of properly approved waste streams containing process-derived radionuclides to this facility.

#### **3.2.1 Idaho Nuclear Technology and Engineering Center Service Waste System and New Percolation Pond General Information**

The Service Waste System collects the process wastewater generated at the INTEC. The wastewater consists primarily of noncontact cooling water, steam condensate, reverse osmosis regenerate, water softener, boiler blowdown wastewater, and other nonhazardous liquids. The Service Waste System monitors the waste streams for radioactivity, and the wastewater is transferred to one of two large percolation ponds for surface disposal. The Service Waste System consists of collection headers, pipes, tanks, valves, pumps, and monitoring and diversion stations (located in multiple buildings throughout INTEC).

Service Waste System wastewater includes only nonhazardous, nonradioactive (less than MCLs or less than 1 DCG with implementation of BAT) waste streams. Separate hazardous or radioactive wastewater from processes and laboratories are managed by the Process Equipment Waste (PEW) Evaporator (low-activity streams), the New Waste Calcining Facility–Evaporator Tank System (high-activity streams), the Tank Farm Facility tanks, or packaged and shipped to a treatment, storage, and disposal facility. Sanitary wastes and other related wastes are either discharged to the INTEC STP or directed to on-site septic tank systems.

In the event radioactivity in the service waste at CPP-797 were to exceed the set threshold level of the in-line continuous monitor, an alarm would sound, and an operator would then manually divert the service waste flow to holding vessel VES-WM-191, usually in less than a minute. VES-WM-191 has a design capacity of approximately 300,000 gallons and would take approximately 2 to 8 hours to fill depending upon the processes in operation. During the diversion, it is expected the source of

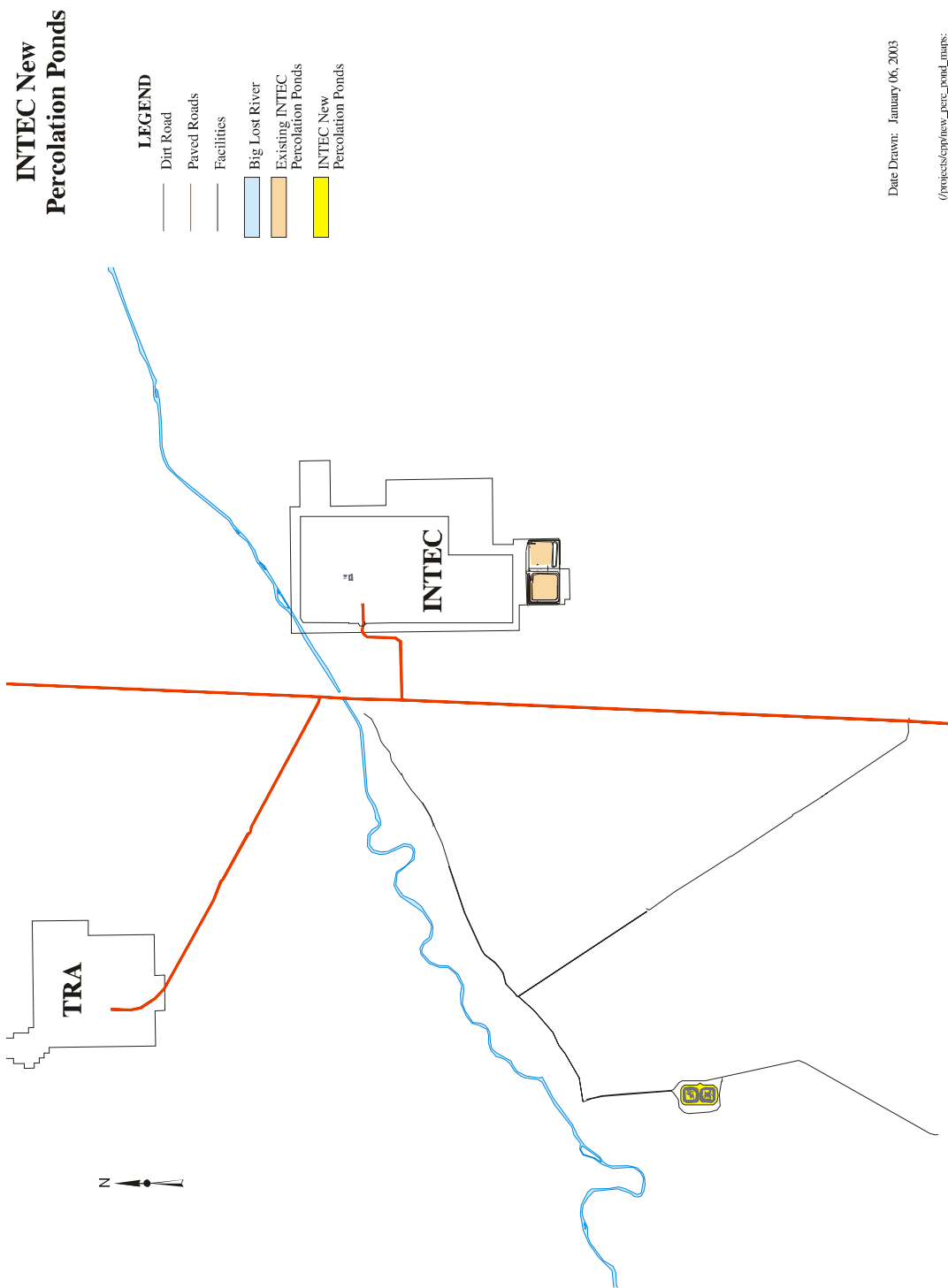


Figure 3. Idaho Nuclear Technology and Engineering Center New Percolation Ponds.

radioactivity would be located and isolated. Radioactively contaminated wastewater collected in VES-WM-191 would then be sent to the PEW system for disposal.

The DEQ approved construction of the New Percolation Ponds on May 18, 2000.<sup>9</sup> Construction of the New Percolation Ponds began in August of 2000.<sup>10</sup> The DEQ issued a WLAP (LA-000130-03) for the New Percolation Ponds on September 10, 2001,<sup>11</sup> and an amended WLAP on March 28, 2002.<sup>12</sup> On August 26, 2002, construction was complete, and the wastewater previously discharged to the Existing Percolation Ponds was discharged to the New Percolation Ponds.

Two sets of electric pumps transfer wastewater from CPP-797 to the New Percolation Ponds. Stainless steel header piping was replaced with high-density polyethylene piping to minimize the effects of microbial corrosion. Two 16-inch lines (primary and redundant) are available to transport the wastewater from CPP-797 to the ponds. Typically, the primary line is used. The redundant line is used as a backup in case the primary line is taken out of service. Additionally, a diesel-driven pumping system is used as the backup for the electric motor systems.

The new pond complex is a rapid infiltration system and is comprised of two ponds excavated into the surficial alluvium and surrounded by bermed alluvial material. Each pond is approximately 305 × 305 ft at the top of the berm and is approximately 10 feet deep. Each pond is designed to accommodate a continuous wastewater discharge rate of approximately 3 million gallons/day.

During normal operation, wastewater is discharged to only one pond at a time. Periodically, the pond receiving the wastewater will be alternated to minimize algae growth and maintain good percolation rates. Ponds are routinely inspected, and the depth is recorded via permanently mounted staff gauges.

The average daily flow to the New Percolation Ponds for Permit Year 2003 (November 2002 through October 2003) was approximately 1,372,000 gallons/day. The total flow for Permit Year 2003 was 500.39 million gallons, which is well below the WLAP flow limit of 1,095 million gallons/year.<sup>6</sup>

### **3.2.2 Sources and Controls for Radionuclide Contamination**

Through 1988, total radioactivity discharged from the Service Waste System to the Existing Percolation Ponds averaged hundreds of curies per year, with tritium being the major contributor. Since 1989 however, total radioactivity averaged less than 1 curie per year. This large reduction is mainly due to two factors: (1) INTEC no longer reprocesses spent nuclear fuel, and (2) the overhead condensates of the Process Equipment Waste (PEW) Evaporator are no longer discharged to the service wastewater stream. Since January 1993, the PEW Evaporator overhead condensates have been sent to the Liquid Effluent Treatment and Disposal (LET&D) Facility for processing.

In the early 1990s, an effort was made to eliminate all potentially contaminated sources from discharging to the Service Waste System. Floor drains were capped, piping was modified, and other physical barriers were implemented to ensure that no known sources of radionuclide contamination are inadvertently discharged to the service waste stream.

In addition, an engineering evaluation was performed in 2001.<sup>13</sup> The purpose of the evaluation was to determine the risk of inadvertent discharge of radiologically contaminated liquids into the Service Waste System. This evaluation sought to confirm the results of the earlier evaluation (described previously) and identify any deficiencies due to subsequent modifications.

The evaluation identified no discharges of process-derived radionuclide-contaminated solutions. In general, INTEC facilities and processes have implemented sufficient engineered physical barriers to prevent inadvertent discharge of radionuclides to the Service Waste System in the event of an operational

upset condition, except for two systems. These two systems are the CPP-666 Sump SU-FT-148 and the CPP-602 LC-Area Sump.

The CPP-666 Sump is an open sump located in a radiological buffer area that could receive radiologically contaminated water solutions from a variety of locations throughout the CPP-666 facility. Under normal operation, the sump was monitored continuously and the contents were automatically diverted to a holding tank (VES-FT-134) if radioactivity was detected above 5,000 counts per minute. An Engineering Change Form (ECF) was originally submitted to complete the permanent piping modifications.<sup>e</sup> However, this ECF has been cancelled with the statement “No physical modifications were required to isolate CPP-666 Sump from the Service Waste System. Double isolation was achieved by using existing valves.” To ensure the double isolation was achieved, an Environment, Safety, and Health self-assessment was performed.<sup>f</sup> The line from the sump to the Service Waste System has two valves that control the flow of water. One valve is manually controlled, and the other is air-actuated. Both valves are locked closed. These two valves have administrative tags and locks to prevent them from being opened, thus preventing a discharge to the Service Waste System. In addition, two valves control the flow from the sump to VES-FT-134. Similar to the valve from the sump to the Service Waste System, there is one manual valve and one air-actuated valve. Both of these valves have been locked open (administrative tags and locks) to allow water to flow from the sump into the tank.

All of the service waste drains in CPP-602 are routed to the CPP-602 LC-Area Sump. The sump area had been posted as a contamination area. In August 2003, the sump was decontaminated, surveyed, and found to be radiologically clean. As a result, the sump is no longer considered or posted as a radiological contamination area or a radiological buffer area.<sup>14</sup>

For the CPP-602 LC-Area Sump, controls (administrative and engineering) have been implemented to ensure inputs to the sump are clean from a radiological standpoint. Caps were placed on all laboratory drain standpipes connected to the Service Waste System that are not in use. Only cooling water that has not become radiologically contaminated is discharged into those drain standpipes currently in use. Each drain standpipe was labeled to indicate that the drain was connected to the Service Waste System and radiologically contaminated discharges were not allowed.<sup>g</sup> All floor drains in radiological buffer areas not in use were plugged with either a mechanical drain plug or waterproof tape or both. Similar to the drain standpipes, only uncontaminated cooling water is allowed to discharge into any floor drains currently in use. In addition, the sump was decontaminated. These corrective actions were completed on September 25, 2001, and documented in the Issue Communication and Resolution Environment (ICARE #25416).

EDF-4545, “Sample Analysis of the Service Waste System, Monthly Composite Samples,”<sup>15</sup> was developed (effective date of May 18, 2004). The purpose of the EDF was to review the potential radionuclide source term that could enter the Service Waste System and determine whether the current sample analyses were adequate to comply with DOE Order 5400.5.

The conclusion reached by the EDF was that current analytical monitoring (gamma spectroscopy) was adequate to comply with DOE Order 5400.5 requirements. The current monitoring assumes that the

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e. E. F. Armstrong, INEEL, e-mail to K. C. Barton, INEEL, “Service Waste Control Barriers for VES-FT-134,” July 16, 2002, 10:36 a.m., CCN 35556.

f. E. J. Scott, INEEL, e-mail to M. G. Lewis, INEEL, “CPP-666 Sump and CPP-602LC-Area Sump,” August 12, 2003, 2:46 p.m., CCN 44383.

g. K. C. Barton, INEEL, e-mail to M. G. Lewis, INEEL, “Service Waste Control Barriers in the CPP-602 Labs,” July 23, 2002, 2:32 p.m., CCN 35555.

strontium-90 (beta emitter) to Cs-137 (gamma emitter) ratio is 1 to 1. However, as the sources of radiological contamination age, it is possible that the 1-to-1 ratio of strontium-90 to Cs-137 may change over time and may no longer be reliable. The following recommendations were made:

- Add gross beta analysis if it is expected that the strontium-90 to cesium-137 ratio has changed significantly. If gross beta analysis is not performed, then ensure the gamma spectroscopy minimum detection limit is 4 pCi/L for cesium-137/barium-137m.
- Require laboratory to report cesium-134 and cesium-137/barium-137m results and any other gamma-emitting radionuclides that are positively detected.
- Eliminate radium-226 and radium-228 as radionuclides of concern.

### 3.2.3 Radiological Sample Results

Data presented below are from January 1, 2003, through March 31, 2004. The radioactivity levels in the service waste are determined from samples taken at the CPP-797 Monitoring Station. The samples are monthly flow proportional composites collected according to approved operating procedures. The monthly composite sample is analyzed using a highly sensitive 24-hour scan for gamma-emitting radiation. No radionuclides were positively identified above the instrument's detectable activity levels in the monthly gamma analyses.

Beginning with the March 2003 monthly composite sample, a gross alpha analysis was added. Positively detected sample results are shown in Table 4. The laboratory performed duplicate and triplicate gross alpha analysis on several of the monthly samples. For these samples, the monthly values shown in Table 4 are the averages calculated from those samples where gross alpha was positively detected.

Table 4. Idaho Nuclear Technology and Engineering Center New Percolation Ponds effluent (CPP-797) gross alpha data for March 2003 through March 2004.

Sample Date	Activity (pCi/L)	MCL <sup>a</sup> (pCi/L)
3/3/03	1.70	15
6/2//03	0.33	15
7/1/03	4.40	15
10/1/03	5.10	15
11/4/03	1.10	15
12/3/03	6.93 <sup>b</sup>	15
1/6/04	2.00	15
2/3/04	3.4 <sup>c</sup>	15
3/3/04	12.11 <sup>d</sup>	15

a. Maximum Contaminant Level for gross alpha, 40 CFR 141.

b. Average of three gross alpha analysis results from the December 3, 2003, composite sample.

c. Average of two gross alpha analysis results from the February 3, 2004, composite sample.

d. Average of three gross alpha analysis results from the March 3, 2004, composite sample.

### **3.2.4 Conclusion**

The best available technology process was implemented in 1993 with the installation of the LET&D Facility, which was designed to remove the majority of process-derived radionuclides. In addition, the installation of physical barriers in the early 1990s and the engineering evaluation in 2001 were undertaken to eliminate all potentially contaminated sources from inadvertently discharging to the Service Waste System.

Data from the routine monthly samples collected from January 2003 through March 2004 continued to show that all activity from gamma-emitting radionuclides are seldom detected in the service waste effluent. All gamma spectroscopy results were below laboratory instrument minimum detection levels.

For the same period, gross alpha results were less than the MCL of 15 pCi/L. The INTEC High Level Waste Operations continues to routinely monitor for gross alpha and gamma-emitting radionuclides.

All new discharges (other than from new projects) to the Service Waste System that may contain process-derived radionuclides are evaluated by WGS. The WGS ensures the liquid waste will be disposed of in accordance with federal, state, and local regulations, and DOE orders. Implementation of PLN-932 provides additional guidance to ensure compliance with DOE Order 5400.5.

Before a new liquid waste stream containing process-derived radionuclides is discharged into the Service Waste System, an evaluation is performed. To ensure the effluent discharged to the New Percolation Ponds complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs prior to discharge into the Service Waste System. If the wastewater is above MCLs but below 1 DCG, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

## **3.3 Documentation of the Best Available Technology Selection Process for the Test Area North/Technical Support Facility Sewage Treatment Plant Disposal Pond**

Only the TAN/TSF Sewage Treatment Plant (STP) Disposal Pond (Figure 4), located southwest of the TSF, requires a BAT evaluation. Documentation of the BAT selection process applies to the TAN/TSF STP Disposal Pond because radionuclides may (although unlikely) inadvertently be released (for example, due to equipment failures) to this facility. In addition, individual waste streams containing process-derived radionuclides may be disposed of to this facility. Only those individual waste streams that have received the appropriate approval may be discharged.

### **3.3.1 Test Area North/Technical Support Facility Sewage Treatment Plant Disposal Pond General Information**

The TAN/TSF STP Disposal Pond is located southwest of the TAN/TSF (Figure 4). The TAN/TSF sewage system collects and transports sanitary waste to the STP. Water is treated and discharged to the TAN/TSF STP Disposal Pond. Sewage or sanitary waste consists primarily of spent water containing wastes from rest rooms, sinks, and showers. The process drain system collects wastewater from process drains and building sources originating from various TAN/TSF facilities and transports the wastewater to a sump where it is commingled with treated sanitary water and then discharged to the TAN/TSF STP Disposal Pond. Process water collected from the process drain system is not treated by the sewage system; rather, the process water bypasses the plant and flows directly to the common sump (TAN-655).

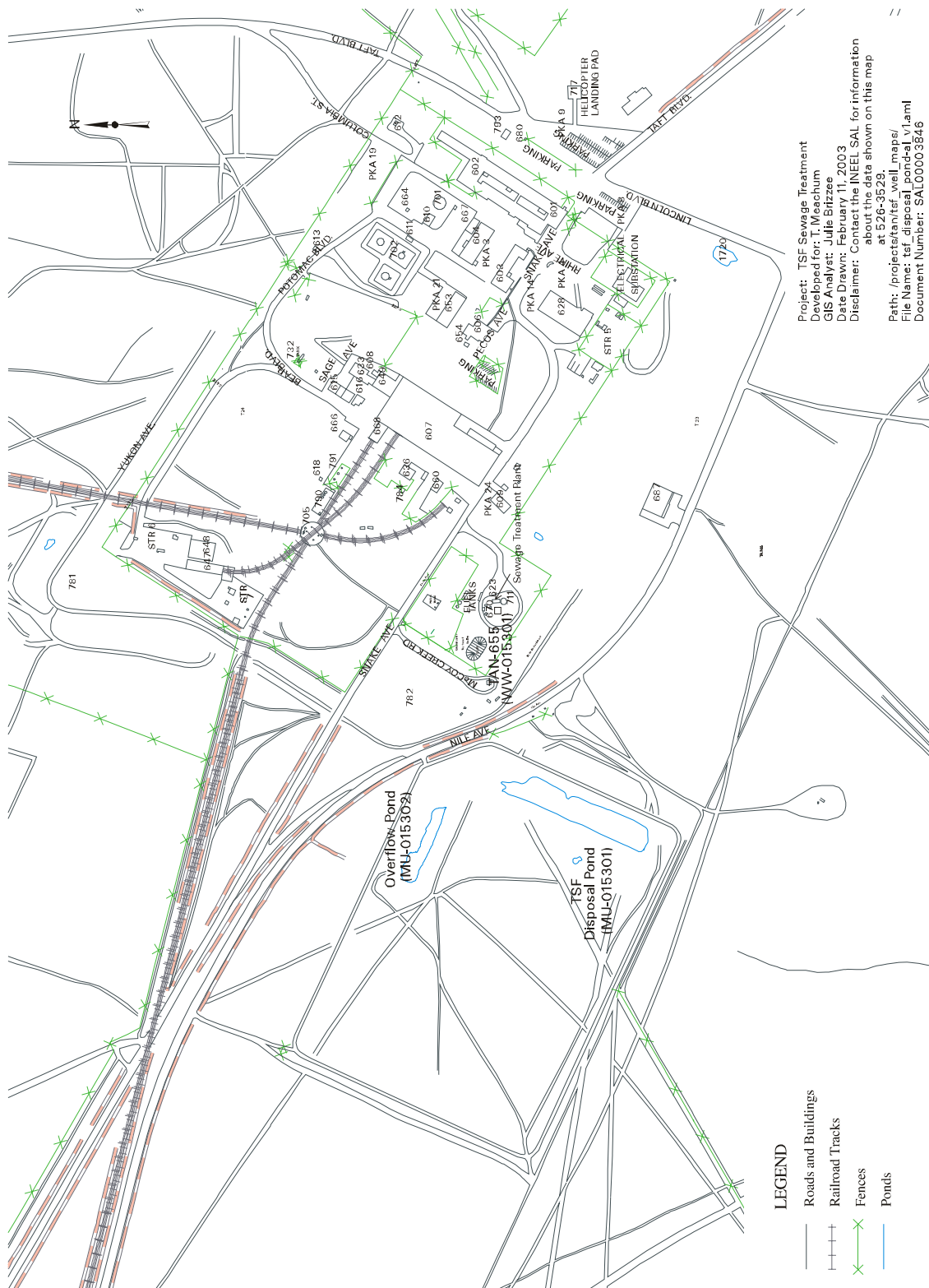


Figure 4. Map of Test Area North/Technical Support Facility.



Wastewater discharged to the process drain includes steam condensate, boiler blow down, water softener regeneration, demineralizer regenerate solution, water tank discharge, cooling water, and pressure relief discharges.

The TAN/TSF STP Disposal Pond was constructed in 1971; before that, treated wastewater was disposed of through an injection well. The Disposal Pond consists of a primary disposal area and an overflow section, both of which are located within an unlined, fenced 35-acre area. The Overflow Pond is rarely used, and is used only when the water is diverted to it for brief cleanup and maintenance periods. The Disposal Pond and Overflow Pond areas are approximately 39,000 ft<sup>2</sup> (0.9 acres) and 14,400 ft<sup>2</sup> (0.33 acres), respectively, for a combined area of approximately 53,400 ft<sup>2</sup> (1.23 acres).

The TAN/TSF STP Disposal Pond is a WLAP facility. On May 9, 1996, DEQ issued a WLAP for the TAN/TSF STP. The original WLAP expired on May 8, 2001. However, on July 12, 2001, DEQ issued a letter authorizing the continued operation of the TAN/TSF STP under the original WLAP.<sup>16</sup> The authorization is effective until DEQ issues a new WLAP.

The average daily flow to the Disposal Pond for Permit Year 2003 (November 2002 through October 2003) was 24,608 gallons/day. The total flow for Permit Year 2003 was 8.98 million gallons, which is well below the WLAP flow limit of 34 million gallons/year.<sup>6</sup>

### **3.3.2 Interim Control Strategy**

It was verified on May 2, 2001, that an interim control strategy (ICS) was required for the TAN/TSF Disposal Pond according to DOE Order 5400.5, Chapter II, Section 3.e(1). The ICS, dated October 2002, was approved by the DOE Idaho manager on April 1, 2003.<sup>17</sup> The ICS shall be reevaluated every 2 years.

### **3.3.3 Sources and Controls for Radionuclide Contamination**

The TAN-655 Lift Station was remediated in August–September 1993 as part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim action.<sup>18</sup> However, some residual radioactive contamination may be in the TAN/TSF process wastewater lines, which could result in some continued radiological contaminant discharges to the Sewage Treatment Plant and Disposal Pond.

Because of past discharges and possible residual contamination in wastewater lines, sludge from the TAN/TSF STP normally has detectable amounts of radioactivity. The sludge will be characterized prior to disposal. The sludge will be disposed of based on the characterization results.

Before any new liquid waste streams containing process-derived radionuclides are discharged into the TAN/TSF STP, an evaluation will be performed. To ensure the effluent discharged to the Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must meet one of the three criteria (DOE Headquarters guidance) in Section 2.1.

The Idaho Completion Project, Execution Plan (ICP, PEP) and Clean/Close TAN PEP are currently in progress. The overall objective of the Clean/Close TAN Project is to accelerate cleanup of the TAN facility. Numerous buildings and structures are undergoing deactivation, decontamination, and decommission. Decommission is the process where a building or structure is taken to its end state through decontamination and/or dismantlement to demolition or entombment (PLN-1415<sup>19</sup>). These activities may influence the radioactivity levels in TAN-655.

### 3.3.4 Radiological Sample Results

Data presented in this section are from January 1, 2003, through March 31, 2004.

In 2003, 24-hour composite samples were collected quarterly from the TAN-655 Lift Station and analyzed for gross alpha, gross beta, and gamma emitters. Strontium-90 was analyzed from the March sample. Samples are collected annually for strontium-89, strontium-90, iodine-129, and tritium. These annual samples were collected on November 20, 2003. Table 5 presents data for radionuclides reported above the minimum detectable activity levels for Calendar Year 2003.

Gross alpha was positively detected in the April sample with an activity of 3.28 pCi/L. This result is well below the MCL of 15 pCi/L.

Gross beta was positively detected in all four samples. The average activity for all four samples was 10.49 pCi/L. The maximum activity for any particular sample was 18.8 pCi/L collected on November 13, 2003, and the minimum activity was 3.32 pCi/L collected on September 18, 2003. For comparison only, the average gross beta activity in the TAN-655 effluent was below the Environmental Protection Agency screening level of 15 pCi/L for community water systems utilizing waters designated by the state as contaminated by a nuclear facility.

Table 5. Test Area North/Technical Support Facility Sewage Treatment Plant (TAN-655) effluent radiological data for Calendar Year 2003.<sup>a</sup>

Parameter	Sample Date	Activity (pCi/L)	MCL <sup>b</sup> (pCi/L)
Gross alpha	4/2/03	3.28	15
Gross beta	3/11/03, 4/02/03, 9/18/03, 11/13/03	10.49 <sup>c</sup>	15 <sup>d</sup>
Strontium-89	11/20/03	1.73	20
Strontium-90	3/11/03	1.69	8
Strontium-90	11/13/03	5.86 (5.86 <sup>e</sup> )	8
Strontium-90	11/20/03	8.30 (5.99 <sup>e</sup> )	8

a. Only those parameters that were reported above the laboratory minimum detectable activity levels are listed.

b. Maximum Contaminant Level, 40 CFR 141 unless otherwise specified.

c. Gross beta was positively detected in all four samples. Table shows average activity of all four samples.

d. Screening level of 15 pCi/L gross beta is used for community water systems utilizing waters designated by the state as contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)].

e. Reanalysis result.

The March 11, 2003, gross beta sample result was 16.1 pCi/L. Because the result was above the screening level of 15 pCi/L and strontium-90 is a strong beta emitter, a request was made to the laboratory to perform a strontium-90 analysis on the remaining sample. Table 5 shows that the strontium-90 sample result was 1.69 pCi/L and well below the MCL of 8 pCi/L. The second and third quarter gross beta sample results decreased to 3.73 pCi/L and 3.32 pCi/L, respectively. Strontium-90 analyses were not performed on these samples.

The fourth quarter gross beta sample (collected on November 13, 2003) result of 18.8 pCi/L was again above the screening level. The results for the strontium-89 and strontium-90 samples collected on November 20, 2003, were 1.73 pCi/L and 8.30 pCi/L, respectively. The laboratory reanalyzed the

November 20, 2003, sample for strontium-89 and strontium-90. The strontium-89 sample result was below the laboratory's minimum detectable activity level. The strontium-90 reanalysis result (5.99 pCi/L) was lower than the original sample result and below the MCL. In addition, the laboratory was requested to analyze the November 13, 2003, sample for strontium-90. The strontium-90 activity level in this sample at 5.86 pCi/L was similar to the reanalysis result from the November 20, 2003, sample.

Monthly sampling for strontium-89 and strontium-90 began in January 2004 at TAN-655. Validated sample results have been received through March 2004. All strontium-89 sample results were less than the minimal detectable activity level.

As shown in Table 6, the January 7, 2004, strontium-90 samples results were over twice the MCL. The strontium-90 activity levels dropped to 3.12 pCi/L in the February sample and then increased slightly to 3.59 pCi/L in the March sample. When collecting the January 7, 2004, samples, sampling personnel noted in the logbook that the samples were light brown, with moderate suspended solids. Typically the samples are clear with little or no suspended solids. It was also noted that there was a strong odor of ammonia at TAN-655. The February 18, 2004, samples were again described as light brown, with moderate suspended solids. The March samples were clear, with only slight suspended solids.

Table 6. Test Area North/Technical Support Facility Sewage Treatment Plant (TAN-655) effluent strontium-90 data for January 2004 through March 2004.

Parameter	Sample Date	Activity (pCi/L)	MCL <sup>a</sup> (pCi/L)
Strontium-90	1/7/04	17.40	8
Strontium-90	1/7/04 <sup>b</sup>	16.40	8
Strontium-90	2/18/04	3.12	8
Strontium-90	3/2/04	3.59	8

a. Maximum Contaminant Level, 40 CFR 141.

b. Duplicate sample.

The first quarter gross alpha, gross beta, and gamma spectroscopy samples were collected on February 18, 2004. All gamma results were below the laboratory instrumentation's minimal detectable activity levels. Gross alpha at 2.99 pCi/L was below the MCL of 15 pCi/L, and the gross beta at 12.0 pCi/L was below the 15 pCi/L screening level.

To try and determine the cause of the elevated levels of strontium-90 in the November 2003 and January 2004 samples, three additional locations upstream of TAN-655 were sampled. Environmental Services Project personnel collected grab sample from Manholes MH049 and MH065, and TAN-623 Sewage Pump Station on February 25, 2004. The samples were analyzed for gross alpha, gross beta, gamma spectroscopy, strontium-89, and strontium-90. Table 7 shows only the sample results that were above the minimum detectable activity levels.

Table 7. Radiological data for Manholes MH049 and MH065, and TAN-623 from the February 25, 2004, sampling event.<sup>a</sup>

Parameter (pCi/L)	MH049	MH049 (Duplicate)	MH065	TAN-623	MCL <sup>b</sup> (pCi/L)
Gross alpha	16.9	10.1	79.8	4.36	15
Gross beta	17.4	20.9	11,000	26.6	15 <sup>c</sup>
Cesium-137	5.83	5.99	10,700	9.59	200
Cobalt-60	— <sup>d</sup>	—	55.5	—	100
Strontium-89	—	0.732	75.3	0.606	20
Strontium-90	0.747	—	1,780	1.64	8

a. Only those parameters that were reported above the laboratory minimum detectable activity levels are listed.

b. Maximum Contaminant Level, 40 CFR 141, unless otherwise specified.

c. Screening level of 15 pCi/L gross beta is used for community water systems utilizing waters designated by the state as contaminated by a nuclear facility [40 CFR 141.26.b(1)(i)].

d. Sample result was below minimum detectable activity levels.

Process wastewater flows through Manholes MH049 and MH065. Manhole MH049 is located near the southwest corner of Building TAN-607, and Manhole MH065 is just north of TAN-655. The samples collected from these manholes ranged from brown to dark brown and the suspended solids from moderate to high. Activity levels (Table 7) for samples from MH065 were significantly higher than their respective MCLs for gross alpha, cesium-137, strontium-89, and strontium-90.

Radiological activity from MH049 was below MCLs for individual radionuclides that were reported above the laboratory minimal detectable activity levels. The average activity for gross alpha from the two samples collected was 13.5 pCi/L and below the MCL. Gross beta was above the screening level in both samples.

TAN-623 is the sewage pump station that discharges the sewage wastewater to TAN-655. These samples were dark brown, with high suspended solids. Similar to MH049, individual radionuclides were below their respective MCLs. Gross alpha was also below the MCL. However, gross beta was above the screening level.

A plan (PLN-1617, "Characterization of Process And Sanitary Waste Discharges to TAN-655 Sump, ESP-044-04"<sup>20</sup>) was written to further evaluate discharges to TAN-655. The plan identifies additional sample locations. These include one process waste drain in Building TAN-608, two process waste sumps in Buildings TAN-607 and 603, two sanitary waste manholes located at the southwest corner of TAN-607 and between TAN-607 and 636, and three process waste manholes (MH049, MH065, and one adjacent to TAN-623). Sampling of these locations has been completed. Data, when received, will be reviewed and evaluated to determine whether corrective actions are required.

### 3.3.5 Conclusion

Major facility construction/expansion is not planned for the TAN/TSF. Activities are being focused on deactivating facilities and completing environmental restoration activities. Therefore, no long-term increased discharges to the TAN/TSF STP Disposal Pond requiring upgrades are expected.

On occasion, elevated gross beta and strontium-90 levels have been detected in the TAN-655 effluent discharged to the Disposal Pond. From January 1, 2003, through March 31, 2004, strontium-90

was above the MCL of 8 pCi/L in the November 2003 and January 2004 samples. The November sample result was 8.30 pCi/L, and the January 2004 sample and duplicate sample results were 17.4 pCi/L and 16.4 pCi/L, respectively.

Because of the elevated strontium-90 levels in those two monthly samples, three additional locations were sampled. These included two process waste manholes (MH049 and MH065) and the TAN-623 Sewage Pump Station. Location MH065 had significantly higher radioactivity levels for gross alpha, gross beta, cesium-137, cobalt-60, strontium-89, and strontium-90 than those in the TAN-655 effluent.

As a follow-up, a sampling plan (PLN-1617) was developed that identified nine locations for additional sampling. Samples have been collected from these locations. The data will be evaluated to determine if there is a radiological source of process-derived radionuclides and whether corrective actions will be required.

The cost for additional treatment of the TAN-655 effluent would likely outweigh the benefit and would therefore be unjustifiable. However, depending on whether a specific source can be identified, it may be possible to reduce the volume or activity levels of that individual source.

By procedure, the responsible manager must not generate a liquid waste without a means for disposing of it. The WGS, at the request of the responsible manager or designee, evaluates discharges (other than from new projects) to the TAN/TSF Disposal Pond that may contain process-derived radionuclides. The WGS ensures the liquid waste will be disposed of according to federal, state, and local regulations, and DOE orders. Implementation of PLN-932 provides additional guidance to ensure compliance with DOE Order 5400.5.

Before any new liquid waste streams containing process-derived radionuclides are discharged into the TAN/TSF STP, an evaluation is performed. To ensure the effluent discharged to the TAN/TSF Disposal Pond complies with DOE Order 5400.5, newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge into the TAN/TSF STP. Completion of the BAT selection process is required if the radioactivity in the wastewater is above MCLs but below 1 DCG. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge.

## 4. CONCLUSION

Last year's *Status Update for Implementing Best Available Technology per DOE Order 5400.5* was reviewed. The purpose of the review was to determine those previously identified liquid waste streams and/or facilities that would require documentation of the BAT selection process or further evaluation. In addition, BBWI-operated facilities were reviewed to determine if any previously unidentified liquid waste streams require the BAT selection process.

Based on the review, two BBWI facilities, the INTEC New Percolation Ponds and TAN/TSF STP Disposal Pond were determined to require documentation of the BAT selection process. In addition, DOE Idaho requested that the 73.5-acre CFA STP land application site be included in Section 3 ("Documentation of the Best Available Technology Selection Process for BBWI-Operated Facilities") of this report to ensure requirements of DOE Order 5400.5, Chapter II, Section 3 are met.

The review concluded that the discharge to the INTEC New Percolation Ponds is below drinking water MCLs for radiological contaminants (some of which may be process-derived) to a soil column. The CFA STP also discharges minimal levels of process-derived radionuclides. Guidance defined in Section 2.1 states, "If the liquid waste stream is below MCLs, this indicates that the goals of the BAT selection process are being met and the liquid waste stream is considered "clean water." However, it is necessary to document this through the BAT selection process." Section 3 of this report is documentation of the BAT selection process for the CFA STP and INTEC New Percolation Ponds according to this guidance. Because liquid waste streams below MCLs are already considered "clean water," additional treatment technologies were considered unnecessary based on cost.

The discharges (TAN-655) to the TAN/TSF STP Disposal Pond are typically below MCLs. However, elevated levels (above 8 pCi/L) of strontium-90 were detected in two of the monthly samples between January 1, 2003, and March 31, 2004. Because of this, additional waste stream characterization efforts are underway to determine whether process-derived radionuclides are intentionally being discharged to TAN-655 or whether the source is from residual radioactive material in the system from past operations or activities. Results from the additional characterization will be evaluated and corrective actions, if required, will be implemented.

In addition, newly generated liquid wastes containing process-derived radiological contaminants disposed to a soil column will be evaluated before discharge. Newly identified liquid waste streams must be below MCLs for radionuclides prior to discharge. For liquid waste streams that are below 1 DCG but above MCLs, the BAT selection process must be completed. The BAT selection process will determine if the wastewater requires additional treatment prior to discharge. This ensures compliance with DOE Order 5400.5 and will also protect human health and the environment. A plan (PLN-932) was recently developed to ensure compliance with the BAT requirements and discharges to soil columns.

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